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Nitrate removal from aqueous solution by almond shells activated with magnetic nanoparticles

Mohsen Arbabi[a], Sara Hemati[a,*], Zahra Shamsizadeh[b], Arman Arbabi[c]

[a]*Department of Environmental Health Engineering, School of Health, Shahrekord University of Medical Sciences, Shahrekord, Iran, Tel. +98 38 33333710; Fax: +98 38 33334678; emails: hemati.sara88@yahoo.com (S. Hemati), marbabi47@yahoo.com (M. Arbabi)*
[b]*Environmental Science and Technology Research Center, Department of Environmental Health Engineering, Shahid Sadoughi University of Medical Sciences, Yazd, Iran, email: z_shamsizadeh69@yahoo.com*
[c]*Department of Environmental Health Engineering, School of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran, email: armanarbabi@gmail.com*

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ABSTRACT

Magnetic activated carbons from almond shells were prepared, characterized, and used to remove nitrate from aqueous environments. The magnetic carbon was prepared by mixing of activated carbon in aqueous suspensions with an aqueous Fe^{3+}/Fe^{2+} solution followed by treatment with sodium hydroxide. The morphologies and surface chemistries of magnetic activated carbon were studied by Fourier transform infrared spectroscopy, field emission scanning electron microscopy, energy dispersive X-ray microanalysis, pH_{pzc}, and Brunauer–Emmett–Teller (BET) analyses. The BET area of magnetic activated carbon was 105.480 m^2/g. The effects of adsorbent dosage, the pH of the solution, initial nitrate ion concentration, and contact time on the removal process were investigated. The amount of remaining nitrate ion was measured by spectrophotometer UV–Vis after filtration. At optimum pH of 4 and equilibrium time of 20 min, adsorption efficiency increased with both increasing of absorbent concentration to 1 g/L and reduction of initial concentration of nitrate ions (76.29%). The equilibrium adsorption was best described by the Langmuir isotherm model ($R^2 = 0.924$). The almond shell activated with magnetic nanoparticles has a good ability to remove nitrate ions from aqueous solutions. Therefore, the use of this relatively easy and simple technology is an effective step in removing nitrate from water.

Keywords: Adsorption; Activated carbon; Almond; Magnetite nanoparticles; Nitrate

* Corresponding author.